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EXAMINER
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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* ESWAR PRIYADARSHAN, DAN MARIUS GRIGOROVICI,  
RAVIKIRAN CHITTARI, OMAR ABDALA, and HAO DUONG

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Appeal 2015-001966  
Application 12/790,486<sup>1</sup>  
Technology Center 3600

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Before BIBHU R. MOHANTY, NINA L. MEDLOCK, and  
ROBERT J. SILVERMAN, *Administrative Patent Judges*.

SILVERMAN, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

The Appellants appeal under 35 U.S.C. § 134(a) from the Examiner's decision rejecting claims 1–7 and 17–21. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

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<sup>1</sup> The Appellants identify Apple, Inc. as the real party in interest. Appeal Br. 3.

### ILLUSTRATIVE CLAIM

The Specification “relates to advertisement inventory and more specifically relates to systems and methods for managing advertisement inventory.” Spec. ¶ 1. Independent claim 1 illustrates the claimed subject matter:

1. A method, comprising:

receiving a request comprising a target inventory slot in an inventory space and a target objective;

identifying inventory atoms in an atom inventory database associated with the target inventory slot based on a hashing process to yield identified inventory atoms, a status of the identified inventory atoms, and an atom cost for the identified inventory atoms, the hashing process reducing a computational complexity for performing the identifying, the identifying comprising:

filtering the inventory space based at least on the target objective to yield potential inventory atoms,

mapping the potential inventory atoms, using the hashing process, to create super atoms in a topological space preserving isomorphic properties of the inventory space, the super atoms having a dimensionality less than the potential inventory atoms, wherein the number of super atoms created by the hashing process is less than the number of the potential inventory atoms,

generating forecast information estimating an inventory for the super atoms in the topological space based on a design matrix modeling availability of impressions over a time period,

projecting the forecast information from the super atoms in the topological space back to the potential inventory atoms in the inventory space, and

based on the forecast information, selecting the identified inventory atoms from the potential inventory atoms;

assembling a proposed inventory slot comprising at least a portion of the identified inventory atoms selected to meet the target objective;

responsive to at least one of the inventory atoms in the proposed slot having a status of unavailable resulting from being associated with at least one booked inventory slot, determining whether to adjust the inventory atoms for at least one of the proposed inventory slot or a previously booked inventory slot in the inventory space associated with the at least one unavailable inventory atom; and

generating a response to the request, the response comprising the proposed inventory slot.

#### CITED REFERENCES

The Examiner relies upon the following references:

Rao et al.                      US 2003/0171990 A1      Sept. 11, 2003  
(hereinafter “Rao”)

Lin et al.                      US 2010/0100407 A1      Apr. 22, 2010  
(hereinafter “Lin”)

Yang                              US 2010/0114696 A1      May 6, 2010

Cosman                         US 2011/0251875 A1      Oct. 13, 2011

Kristin P. Bennett et al., *Density-Based Indexing for Nearest-Neighbor Queries*, Microsoft Research Technical Report MSR-TR-98-58 (Oct. 28, 1998) (hereinafter “Bennett”)

#### REJECTIONS

I.      Claims 1–7 and 17–21 are rejected under 35 U.S.C. § 101 as directed to non-statutory subject matter.<sup>2</sup>

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<sup>2</sup> The Final Office Action rejected claims 1–7 under 35 U.S.C. § 101 as directed to non-statutory subject matter. Final Action 2–4. As a new ground of rejection, the Answer presented a revised rejection, of claims 1–7 and 17–

II. Claims 1–7 and 17–21 are rejected under 35 U.S.C. § 103(a) as unpatentable over Yang, Cosman, Rao, Lin, and Bennett.

### FINDINGS OF FACT

We rely upon and adopt the Examiner’s findings stated in the Final Office Action at pages 4–25 and the Answer at pages 4–11, except as stated otherwise herein. Additional findings of fact may appear in the Analysis below.

### ANALYSIS

#### *Rejection Under 35 U.S.C. § 101*

According to the Examiner, applying the two-part analytical framework of *Alice Corp. Pty. Ltd. v. CLS Bank International*, 134 S. Ct. 2347, 2355 (2014), claims 1–7 and 17–21 are “directed to the abstract idea of managing an inventory of advertising impressions, a fundamental economic activity,” and the claims otherwise recite “additional element(s) or combination of elements” that “amount(s) to no more than: application of the idea on a general purpose computing system.” Answer 3–4.

In response, the Appellants argue that, in regard to the first part of the *Alice* analysis, “the abstract idea has not been identified with particularity and the claim has not been analyzed as a whole,” noting that “it appears as though the Examiner is ignoring particular claim elements that provide meaningful limitations.” Reply Br. 3. Further, the Appellants contend: “Unlike the cases where the Supreme Court has held claims to be abstract, the current claims are not exclusively related to the execution of a financial

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21, under 35 U.S.C. § 101 as directed to non-statutory subject matter.  
Answer 3–4.

transaction. In fact, the independent claims do not require any type of financial exchange at all.” *Id.* The Appellants also liken the claims to those in *PNC Bank v. Secure Access, LLC*, CBM2014-00100 (PTAB Sept. 9, 2014), arguing that the present claims “require a fundamental change to the data; a change that cannot be performed in the human mind.” *Id.* at 4.

In regard to the second step of the *Alice* analysis for claim 1, the Appellants argue:

The claimed steps provide a technical advantage because they facilitate the identification of inventory atoms for filling a request for a target inventory slot. As the claim itself recites, the claimed hashing process is used for “reducing a computational complexity for performing the identifying.”

Reply Br. 5. Consequently, the Appellants continue, unlike the situation addressed in *Alice*, “the granting of a patent would not preempt use in all fields or result in a monopoly over a fundamental practice.” *Id.*

The second step of the *Alice* framework is “a search for an ‘inventive concept’ — i.e., an element or combination of elements that is ‘sufficient to ensure that the patent in practice amounts to significantly more than a patent upon the [ineligible concept] itself.’” *Alice*, 134 S. Ct. at 2355 (quoting *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 132 S. Ct. 1289, 1294 (2012)). This prong of the analysis may be satisfied by a “non-conventional and non-generic arrangement of known, conventional pieces.” *Bascom Global Internet Servs., Inc. v. AT&T Mobility LLC*, 827 F.3d 1341, 1350 (Fed. Cir. 2016).

Although the rejection states that the claimed elements merely implement the abstract idea “on a general purpose computing system” (Answer 4), the Examiner’s findings and analysis do not sufficiently address

the significance of the ordered combination of features of the claimed invention (Reply Br. 5). Such a “particular arrangement of elements” that creates “a technical improvement” might satisfy *Alice*’s second step. *Bascom*, 827 F.3d at 1350. Accordingly, the Appellants’ arguments are persuasive of error in the rejection of independent claim 1 and, for the same or similar reasons, independent claim 17.

In view of the foregoing, the rejection of claims 1–7 and 17–21 under 35 U.S.C. § 101 is not sustained.

*Rejection Under 35 U.S.C. § 103(a)*

The Appellants offer five arguments for error in the rejection of independent claim 1 as obvious over the cited references. *See* Appeal Br. 7–17. As set forth below, each of these arguments is unpersuasive. The Appellants rely upon these same arguments, in regard to independent claim 17 and dependent claims 2–7 and 18–21. *Id.* at 15–16. Accordingly, the rejection of claims 1–7 and 17–21 under 35 U.S.C. § 103(a) is sustained.

**1. Whether Lin Teaches or Suggests “*mapping the potential inventory atoms . . . to create super atoms in a topological space preserving isomorphic properties of the inventory space*”**

The Appellants (Appeal Br. 7–9) argue that Lin does not teach or suggest the following features of claim 1:

mapping the potential inventory atoms . . . to create super atoms in a topological space preserving isomorphic properties of the inventory space.

Yet, although the Appellants contend that the rejection provides “absolutely no discussion of mapping to a topological space or of maintaining isomorphic properties of the inventory space” (Reply Br. 7), the Appellants do not point to any error in what the Examiner calls “a simple hypothetical

example of manipulation of a set of data could satisfy the topology and isomorphic properties recited by Appellant” (Answer 6). Rather, the crux of Appellants’ argument is that the Examiner’s example is an improper attempt to take Official Notice of features not shown in Lin. *See* Reply Br. 6–7.

The Examiner’s example is a set of impressions (the claimed “atoms”) — “#1 male 30 years old”; “#2 male 20 years old”; and “#3 female 20 years old” — and various groupings/requests thereof (the claimed “super atoms”) that satisfy the features of the claimed “mapping”:

A request for persons older than 50 on the hypothetical set would yield an empty set. A request for males, would yield a union of 1, 2. A request for 20 year olds would yield a union of 2, 3. A request of male 20 year olds would yield only 2. Accordingly, this hypothetical example could satisfy the topological constraints suggested by Appellant. (Appellant’s Brief, p.8). The examiner interprets grouping of impressions to read on “super atoms”. Furthermore, as the properties of the impressions do not change as they are grouped (impression #2 is still a 20 year old male, even if the request groups it with a 20 year old female), it is believed that the isomorphic properties of the items are retained.

Answer 6. Although the Appellants dispute that the Examiner’s example “preserv[es] isomorphic properties of the inventory space,” as opposed to the claimed “atoms” themselves, the Appellants fail to explain the basis for the alleged deficit. Reply Br. 7–8.

Even though the Examiner’s example is not set forth in Lin, the Examiner demonstrates that it is extrapolated from features described in the reference. Specifically, Lin teaches that impressions/atoms may have multiple dimensions (per Lin ¶ 25, “the page is on Yahoo Finance; the ad impression is shown in the North position; the visitor is a male, 25 years old, living in the United States, California, having interests in finance and travel;



the visit time is 3:00 PM, Jul. 2, 2009 (a time in the future)”) and that an advertiser may make a request (e.g., by a contract) based upon fewer than the total number of dimensions that exist for a particular impression/atom (per Lin ¶ 30, requests could call for “Yahoo!finance users who are California males” and “Yahoo! users who are aged 20–35 and interested in sports”). See Answer 5–6. Therefore, the Appellants fail to show that Lin does not suggest the identified features of claim 1.

**2. Whether Lin Teaches or Suggests “*super atoms having a dimensionality less than the potential inventory atoms, wherein the number of super atoms . . . is less than the number of the potential inventory atoms*”**

The Appellants contend that Lin does not teach or suggest the following features of claim 1:

super atoms having a dimensionality less than the potential inventory atoms, wherein the number of super atoms . . . is less than the number of the potential inventory atoms.

Appeal Br. 10–11.

According to the Examiner, the claimed arrangement flows directly from the conditions (derived from Lin) noted above, because one million impressions (i.e., “potential inventory atoms”) in the inventory may be allocated to two groups (i.e., two “super atoms”), based upon an advertiser’s requests. Answer 7.

In response, the Appellants argue that the Examiner’s comparison is “inapplicable” to the claimed features:

[T]he fact that an advertiser can make a request based on a smaller set of dimensions does not change the number of dimensions available. The number of dimensions available for the impression remains the same and is not reduced simply because the request made by the advertiser identifies the

impression based on a fewer number of dimensions than those available.

Reply Br. 8.

The Appellants' argument is unpersuasive. The claimed features in question concern grouping potential future impressions ("atoms") in various ways, based upon greater or fewer conditions — precisely as the Examiner discusses. The Appellants do not present a reason why the Examiner's analysis based upon the teachings of Lin are not sufficient.

**3. Whether Lin Teaches or Suggests *“projecting the forecast information from the super atoms in the topological space back to the potential inventory atoms in the inventory space”***

The Appellants contend that Lin does not teach or suggest the following features of claim 1:

projecting the forecast information from the super atoms in the topological space back to the potential inventory atoms in the inventory space.

Appeal Br. 11–12.

The Examiner's position (Answer 8) is that Lin (¶¶ 37, 72, Fig. 4) teaches the claimed “mapping” of forecasted viewer impressions (“potential inventory atoms”) to contracts (“super atoms”) — as discussed above, in Section 1 — and that the delivery of forecasted impressions to the advertiser constitutes the claimed “projecting the forecast . . . back to . . . inventory space.” Answer 9; *see also* Final Action 12–13.

The Appellants argue that “mapping/projecting among topological spaces is a well-defined mathematical concept that must be interpreted in its proper context” and that the Examiner “ignored the limitation that requires projecting from a topological space back to the inventory space.” Reply Br. 8. Further, the Appellants contend that claim 1 “goes on to utilize the

information that is projected from the topological space to assemble the inventory slot and ultimately respond to the request”; the claimed method “is not simply delivering impressions to the advertiser, but is done to facilitate selection of appropriate atoms/impressions that may ultimately be used by an advertiser.” *Id.* at 9.

The Appellants’ argument is unpersuasive. The issue is whether Lin teaches or suggests what is claimed, regardless of any lack of mathematical nomenclature. Moreover, as for the matter of whether Lin facilitates selection of appropriate “atoms,” this is addressed in other claim limitations:

generating forecast information estimating an inventory for the super atoms in the topological space based on a design matrix modeling availability of impressions over a time period, . . . and

based on the forecast information, selecting the identified inventory atoms from the potential inventory atoms.

The Appellants did not address these limitations in the Appeal Brief and, thus, may not raise them for the first time in the Reply Brief. *See* 37 C.F.R. § 41.41(b)(2) (“Any argument raised in the reply brief which was not raised in the appeal brief . . . will not be considered by the Board for purposes of the present appeal, unless good cause is shown.”)

#### **4. Whether Combining Bennett with the Other References Constitutes Impermissible Hindsight**

The Appellants contend that the rejection of claim 1 is erroneous because combining Bennett (which is relied upon for the “hashing” features of the claim) with the other references constitutes an impermissible hindsight reconstruction. Appeal Br. 12–14; Reply Br. 9. In support of this contention, the Appellants point out: Bennett mentions advertising only once; Bennett does not address claim 1’s use of “hashing” to “map[]” among

“topological space[s]”; Bennett criticizes “hashing”; and Bennett is a “scholarly article” from a “different field of endeavor.” Appeal Br. 13–14; Reply Br. 9.

The Appellants’ arguments are not persuasive of error. As the Examiner explains, Bennett does not discuss mapping among topological spaces, but does explicitly state that its technology is applicable in the field of “advertising (especially online)” — the very field of the Appellants’ purported invention — and also that hashing “provides a general scheme for mapping data into a lower dimensional space,” which is one of the problems that the Appellants seek to address through the use of hashing in claim 1. Answer 9–10 (citing Bennett, pp. 1, 4–5). The Examiner notes that Lin also discloses the need for algorithms to search high-dimension data sets (*id.* at 10 (citing Lin ¶ 39)), which creates an additional reason why a person of ordinary skill in the art might have been drawn to Bennett. In addition, although the Appellants contend that Bennett is from a different field of endeavor, the Appellants do not establish Bennett as non-analogous art. On the contrary, because Bennett states that its teachings apply to the field of online advertising, Bennett is in the same field of endeavor as the claimed invention and, in any event, is at least reasonably pertinent to the problem that the Appellants address in the claimed subject matter.

#### **5. Whether Bennett “Teaches Away” from the Claimed Invention**

The Appellants allege that Bennett teaches away from the purported invention of claim 1, because Bennett depicts Locality Sensitive Hashing (“LSH”) as inferior to the new algorithmic approach that Bennett introduces — Density-Based Indexing (“DBIN”). Appeal Br. 14–15 (citing Bennett, pp. 4–5, 7); Reply Br. 9. The referenced portion of Bennett states:

Locality-Sensitive Hashing provides a general scheme for mapping data into a lower-dimensional space and finding nearest neighbors in the reduced space. The results correspond to an approximate nearest neighbor query in the original space. Locality-Sensitive Hashing also provides an approximate answer but, unlike the proposed [DBIN] algorithm, it does not provide a probabilistic guarantee of good performance.

Bennett, pp. 4–5 (footnote omitted).

The Appellants’ argument is not persuasive. “A reference does not teach away . . . if it merely expresses a general preference for an alternative invention but does not ‘criticize, discredit, or otherwise discourage’ investigation into the invention claimed.” *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 567 F.3d 1314, 1327 (Fed. Cir. 2009) (quoting *In re Fulton*, 391 F.3d 1195, 1201 (Fed Cir. 2004)). Such is precisely what the Appellants recognize: “Bennett describes LSH as a **weaker** alternative to the DBIN approach that it discloses and discourages the use of hashing in favor of the DBIN method.” Appeal Br. 15. Indeed, the Examiner explains that a person of ordinary skill in the art would have had sound reasons for adopting the hashing technique, in view of Bennett’s disclosure:

That Bennett explicitly mentions LSH as background art would support that the notion that the technique would have been well known to one of ordinary skill in the art at the time. Furthermore, in context, Bennett is a research paper. Merely publishing an improvement to existing algorithms would not guarantee that one of ordinary skill in the art would immediately abandon previous proven algorithms. Indeed, existing proven algorithms could continue to be used for many reasons. They could be well understood, less costly to use or the newly published algorithm, though promising better performance, remains unproven in real world practice.

Answer 11.

DECISION

We REVERSE the Examiner's decision rejecting claims 1–7 and 17–21 under 35 U.S.C. § 101.

We AFFIRM the Examiner's decision rejecting claims 1–7 and 17–21 under 35 U.S.C. § 103(a).

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED